

BIDDER _____

BID SECURITY _____

CITY OF NEWARK
Delaware

CONTRACT NO. 15-01

PURCHASE OF A 10/11.2/14 MVA POWER TRANSFORMER

NOTICE

Do not disassemble. Return intact with
properly completed forms or bid may be rejected.

CITY OF NEWARK
Delaware

CONTRACT NO. 15-01

PURCHASE OF A 10/11.2/14 MVA POWER TRANSFORMER

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CITY OF NEWARK
Delaware

CONTRACT NO. 15-01

PURCHASE OF A 10/11.2/14 MVA POWER TRANSFORMER

NOTICE OF LETTING

Sealed bids for Contract No. 15-01, Purchase of a 10/11.2/14 MVA Power Transformer will be received in the Purchasing Office, Newark Municipal Building, 220 South Main Street, Newark, Delaware, 19711 until 2 p.m., prevailing time, Tuesday, February 10, 2015, and will be publicly opened and read aloud in the Council Chamber shortly thereafter.

Copies of the contract documents may be obtained on the City's website at www.cityofnewarkde.us.

CITY OF NEWARK
Delaware

CONTRACT NO. 15-01

PURCHASE OF A 10/11.2/14 MVA POWER TRANSFORMER

GENERAL PROVISIONS

1. BIDS

Each bid shall be submitted on the proposal form included herein. The proposal and all other required documents must be submitted in a sealed envelope clearly identified with the bidder's name and marked, "City of Newark - Contract No. 15-01, Purchase of a 10/11.2/14 MVA Power Transformer," and will be received in the Purchasing Office, 220 South Main Street, Newark, Delaware, 19711 until 2 p.m., prevailing time, Tuesday, February 10, 2015. Each bid so submitted shall constitute an irrevocable offer for a period of sixty (60) days following the bid opening date.

2. BID SECURITY

No bid will be considered unless accompanied by a certified check, cashier's check or bid bond in the amount of five percent (5%) of the bid. If a bid bond is submitted, it must be made out on the attached "Bond to Accompany Proposal" form. The successful bidder, upon his failure or refusal to execute and deliver the contract within ten (10) days after he has received notice of acceptance of his bid, shall forfeit to the City for such failure or refusal, the security deposit with his bid.

3. AWARDS

Following review of all bids by the City Manager and her recommendation to the Mayor and Council, awards, if any, will be made to the best responsible bidder. The Mayor and Council reserve the right to reject any or all bids and to waive minor irregularities and defects in form where the best interests of the City would be served. The City reserves the right to divide the award of the contract into each of the parts designated in the specifications and proposal.

4. TAXES

The bid price shall not include federal or state taxes. If applicable, the bidder shall furnish the City with the necessary tax exemption forms in triplicate upon submission of his invoice.

5. CONTRACT SURETY BOND

A contract surety bond satisfactory to the City of Newark and in the full amount of the contract may be required by the successful bidder within ten (10) days of the contract award date. Upon receipt of this surety bond, the City will return any certified or cashier's check submitted as bid security.

6. DELIVERY

The manufacturer shall give at least seven days notice to City of Newark before shipment. Transformer shall arrive locally the night before it is to be unloaded at the substation site. Fans and separate material shall be shipped in an open truck for crane unloading.

The unit substation shall be shipped as a complete unit. Digital Impact recorders with GPS for both vertical and lateral shall be located in weatherproof housing. Vendor shall be responsible for obtaining shipping heights and clearances to determine shipping limitations. Purchase price of transformer shall include all shipping costs **F.O.B. Rear of 300 East Main Street Substation, Newark, Delaware.** Truck shipments of oil and accessories shall be F.O.B. Substation, Newark, Delaware. One week's notice to the City shall be given before shipments are made. The successful bidder shall include the type and serial number of all equipment on invoices and packing slips.

7. INSPECTIONS

All equipment shall be subject to final inspection. If, in any way, an item fails to meet the terms of the contract, it may be rejected or liquidated damages charges made. The decision of the City will be final and any rejected items or material will have to be replaced at the expense of the bidder.

8. INTENT OF SPECIFICATIONS

It shall be the bidder's responsibility to furnish the equipment specifically indicated in these specifications and

such other as may be required.

9. REGULATIONS AND EXCEPTIONS

Any and all exceptions which are taken to the specifications shall be noted on the Proposal form. The listing of an exception may be grounds for rejection. All equipment must meet all applicable federal or state regulations.

10. STANDARDS AND MANUFACTURER'S WARRANTY

All equipment will be unused in all component parts and will be the latest current production including all accessories. The specifications will be construed as the minimum required. When the manufacturer's standards exceed these, the standard units will be furnished. All material will be free of defects. Manufacturer's standard warranties shall apply.

11. WORKMANSHIP

Workmanship shall conform to the best current manufacturing practice followed for equipment of the type. Component parts and units will be manufactured to definite standard dimensions, with proper fits and clearances.

12. ADVERTISEMENT

It is further agreed that any bidder submitting a bid will not use the name of the City in any advertisement without first obtaining the written consent of the City Manager.

13. EEO AND LICENSING

The bidder shall possess all business and other licenses required by the State of Delaware and also be a fair and equal opportunity employer.

14. NONCOLLUSION

The vendor shall not, either directly or indirectly, enter into any agreement, participate in any collusion, or otherwise take any action in restraint of free competitive bidding in connection with the contract.

15. INQUIRIES AND ADDENDA

Any inquiries regarding the bidding process shall be directed to Ms. Cenise Wright, Purchasing Administrator, at 302-366-7022. Any questions regarding the specifications shall be

directed to Mr. Rick Vitelli, Director of the Electric Department, at 302-366-7050. Any changes to the contract documents shall be made only by numbered addendum(a) issued not later than four (4) days prior to the date set for bid opening. Prospective bidders shall bear the entire responsibility for being sure they have received any and all such addenda.

16. DAMAGES FOR LATE DELIVERY

The dates for delivery of the equipment are important and may influence the award of the contract. Submitted delivery dates shall be calculated from the date of notification of award. Liquidated damages of \$25.00 per calendar day may be assessed by the City, at its discretion, for every day that delivery is extended beyond the submitted delivery date.

17. PAYMENT

Payment shall be made as follows subject to final inspection and acceptance of the items by the City.

Payment will be under the following schedule:

- 10 % upon award of bid
- 30 % upon completion of design and material order
- 30 % upon completion of assembly
- 20 % upon completion of final testing
- 10 % upon delivery and acceptance (not to exceed 10 days from receipt)

18. INDEMNIFICATION

The contractor shall solely be responsible and liable for the accuracy and completeness of all work performed and shall agree to indemnify, defend and hold harmless the City of Newark, its officers, agents and employees, from and against any and all claims, actions, suits and proceedings arising out of, based upon or caused by negligent acts, omissions or errors of or the infringement of any copyright of patent, by the contractor, its officers, agents, employees or subcontractors, in the performance of the contracted agreement.

19. TERMINATION OF AGREEMENT

This agreement may be terminated by the City upon thirty (30) days written notice if the contractor fails to perform satisfactorily in accordance with the terms and conditions of

the contract. In the event this agreement is terminated, the contractor shall be paid for services satisfactorily rendered up to the termination date.

CITY OF NEWARK
Delaware

CONTRACT NO. 15-01

PURCHASE OF A 10/11.2/14 MVA POWER TRANSFORMER

TECHNICAL SPECIFICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Specifications for manufacture and delivery of one 10/11.2/14 MVA Substation Transformer. Bids for rebuilt transformers will not be accepted.
- B. The City of Newark reserves the right to evaluate similar units in operation for quality and workmanship prior to selection of the successful bidder. The City of Newark reserves the right to waive irregularities, to reject all bids, and to select the bid deemed by the City of Newark to be in the best interest of the City of Newark.
- C. Bidder must supply transformer from manufacturing facility within North America.

1.02 REFERENCES

- A. The transformer shall be designed, built and tested in accordance with the ANSI/IEEE, NEMA, ASTM and NFPA Standards including but not limited to the following:
 - 1. ANSI/IEEE C57.12.00 - Standard General Requirements for Liquid Immersed Distribution, Power, and Regulating Transformers.
 - 2. ANSI/IEEE C57.12.10 - American National Standard for Transformer Safety Requirements.
 - 3. ANSI/IEEE C57.12.90 - IEEE Standard Test Code for Liquid Immersed Distribution, Power, and Regulating Transformers.
 - 4. ASTM A 345 - Standard Specification for Flat-Rolled Electrical Steels for Magnetic Applications.

5. ASTM B 324 - Aluminum Rectangular and Square Wire for Electrical Purposes.
6. ASTM B 48 - Standard Specifications for Soft Rectangular and Square Bare Copper Wire for Electrical Conductors.
7. ASTM D 177 - Standard Guide to Test Methods and Specifications for Electrical Insulating Oils of Petroleum Origin.
8. ASTM D 3487 - Standard Specification for Mineral Insulating Oil Used in Electrical Apparatus.
9. ASTM D 877 - Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes.
10. IEEE C57.12.80 - Standard Terminology for Power and Distribution Transformers.
11. IEEE Std. 21 - Outdoor Apparatus Bushings.

1.03 TESTING

A. Testing shall be conducted as follows:

1. Transformer shall be fully assembled in the factory prior to testing, use of test bushings or test radiators is not allowed.
2. Testing requirements shall be conducted as per ANSI/IEEE standards, including but not limited to the following:
 - A. Insulation Resistance
 1. Each winding-to-ground and to other windings.
 2. Core-to-ground.
 3. Surge arrestors.
 - B. Insulation dielectric loss and power factor tests of bushings and surge arrestors.
 - C. Ratio tests primary to secondary.

1. All no load taps with LTC on rated.
2. All LTC positions with no load on rated.
- D. Polarity and phase-relation tests.
- E. No-load loss and exciting current at rated voltage and 110% rated voltage.
- F. Exciting current at rated voltage.
- G. Impedance and load loss at base 55 degrees C rating and at maximum 65 degrees C.
- H. Temperature rise at maximum 55 degrees C rating. Records of temperature tests performed on duplicate or essentially duplicate transformers will be accepted.
- I. Applied potential.
- J. Induced potential.
- K. Efficiency at all KVA ratings.
- L. Winding resistance on all rated voltage and all no load tap positions.

1.04 SUBMITTAL

- A. Two (2) sets of the following shall be submitted to the Engineer for Approval:

1. Approval Submittal

- A. Shop Drawings: Include wiring schematics with connection diagrams.
- B. Product Data: Provide data showing dimensions and ratings for components.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
- D. Include instructions for storage, handling, protection, examination, preparations, and installation.

E. Warranty/Guarantee.

2. Final Submittal

A. Operation and Maintenance manuals. Six (6) copies each complete with drawings are to be submitted to the City of Newark.

B. Drawings to include the following:

1. Outline diagram (include sample with bid).

2. Transformer nameplate.

3. Schematic diagrams.

4. External Connection Diagrams.

5. Internal Connection Diagrams.

6. Drawings shall be submitted in AutoCAD DWG format.

7. Certified test reports.

C. Submittals shall be mailed to City of Newark Electric Department, Attn: Mr. Rick Vitelli, Director, 220 South Main Street, Newark, Delaware 19711.

1.05 MANUFACTURERS AND EQUIPMENT STANDARDS

- A. CG Power Systems
- B. Waukesha Electric Company
- C. General Electric Company
- D. Kuhlman Electric Company
- E. Pennsylvania Transformer Technology Company
- F. R.E. Uptegraff Transformer Company
- G. Virginia Transformer
- H. Niagara Transformer
- I. Delta Star
- J. ABB T & D Company
- K. Approved equal
- L. WEG

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. EQUIPMENT

1. Factory assemble to full extent possible for minimum field reassembly.
2. Furnish new equipment, of first-class construction conforming to best modern practice.
3. Supply all necessary material such as insulating oil, bolts, nuts, washers, wiring materials, etc. as required for complete field assembly and installation.
4. Silverplate or tinplate all primary current connections and joints.
5. Provide engraved laminated plastic nameplates for each instrument or control device mounted on the equipment.
6. Tag and package separately all spare parts and tools. Identify on Bill of Lading as "City of Newark's Spare Parts".

B. CONTROL WIRING

1. Completely install all internal control wiring at the factory.
2. Make all connections at equipment studs or terminal blocks. Terminate all CT leads on short circuiting type terminal blocks. Terminate all other leads on manufacturer's standard type terminal blocks.
3. Terminate all points requiring external wiring connections at numbered points on terminal blocks conveniently grouped to receive the City of Newark's cables.
4. Install internal wiring in horizontal and vertical wireway designed for easy accessibility to interior panel wiring. Wiring bundles may be used where wireway is not easily installed.

5. Provide all wiring necessary for all equipment specified, and for wiring for future equipment where such wiring is specified.
6. Factory test all wiring for grounds, opens and proper continuity, and for proper operation of all relays, meters, instruments, switches, lights and interlocks.
7. Wire all spare contacts on control switches, auxiliary relays, and alarm devices to external connection terminal blocks.
8. Install all internal wiring without splices.
9. Provide extra flexible hinge wire in areas subject to flexing, such as on hinged brackets or swing racks, if used.
10. Terminal blocks:
 1. Use heavy-duty terminal blocks rated at least 20 amperes, 600 volts.
 2. Identify each terminal on each block by stamping or marking the terminal designation permanently on the block.
 3. Mount terminal blocks in vertical rows on interior sides or divider panels with means for cleating external control cables which enter from the bottom. Allow for cable entry.
 4. Provide terminal blocks with identification to provide at least 24 spare terminals having no internal connections or designated future connections.
11. No more than two wires shall be terminated at any one terminal point.
12. All control wiring shall be terminated with pre-insulated ring-tongue compression terminals lugs.
13. Provisions to prevent chafing shall be provided at all entrances and exits of conduit. Fittings used with the rigid conduit system shall be of the screwed type, with all connections and

terminations made watertight and corrosion resistant. Electrical metallic tubing (EMT) and plastic conduit shall not be used for any service associated with the transformer.

C. FINISH

1. Apply finish to all steel surfaces of equipment. Finish shall follow ANSI standards.
2. Clean and treat surfaces with phosphatizing process or equal and apply all necessary filler before application of finish.
3. Apply at least one coat of corrosion resistant primer, having a minimum dry film thickness of 2 mils, and at least two finish coats as indicated, each having a minimum dry film thickness of 1 - ½ mils.
4. Apply exterior finish coats in ANSI 70 gray. Finish coats on the interior of cabinets shall be white.
5. Provide durable non-skid surface on transformer tank top and LTC compartment top.
6. Bottom of transformer shall be rubberized protection coating a minimum of 1/32" thick.

D. SOUND LEVELS

The transformer sound level in decibels (dB) shall meet NEMA and ANSI standards.

E. GAUGES

All gauges shall have alarm contacts and be manufactured by Qualitrol.

F. EXTERNAL VOLTAGE SOURCE

All externally powered wiring to the transformer shall be grouped together as much as possible and connected to a terminal block which shall be marked with a laminated plastic nameplate having 3/16-inch high white letters on a red background as follows:

DANGER - EXTERNAL VOLTAGE SOURCE

1. Externally powered wiring shall include but not be limited to alarms, annunciator, protective devices, LTC and LTC control, fans and fan control and instrumentation circuits.
2. 120/240 volt single phase station service control voltages to be provided. Control voltages to be protected by suitably sized AC circuit breakers.
3. 115 volt single phase AC potential to be provided for LTC control. AC potential to be protected by a suitably sized circuit breaker.
4. 48 volt dc control voltage will be available from station batteries. Control voltage if needed to be provided by a suitable sized DC circuit breaker.

2.02 TRANSFORMER EQUIPMENT AND MATERIALS

A. TYPE AND DESIGN

1. Design shall conform to references listed herein and other applicable ANSI/IEEE Standards.
 - A. Base: Construct of structural steel shapes and/or plate to form a rigid skid on which the transformer can be slid or rolled on either main centerline axis. Base shall be designed to provide natural draft ventilation under the transformer when placed on a flat concrete foundation.
 - B. Provide jacking provisions for lifting complete transformer.
 - C. Provide pulling eyes for pulling transformer.
 - D. Tank Assembly
 1. Welded steel plate construction.
 2. Constructed without corner welds on the main tank. Tank seams shall be double welded (inside and outside) and shall be a minimum of 6" from the corner. All welds shall be cleaned and ground smooth

prior to surface coatings. Tank bracing shall be sealed tubular construction.

3. Absolutely oil and gastight with all fittings in place.
4. Capable of withstanding without permanent deformation pressure 25 percent greater than the maximum operating pressure resulting from the oil preservation system per ANSI standard.
5. Suitable for full vacuum filling and vacuum drying.
6. Provided with tanking guides for centering core and coil assembly.
7. Gasketed joint to have machined surfaces on both sides, with gasket retainers and metal-to-metal stops, to assure even and effective pressure, avoid overstressing gasket, and to maintain oil tightness of joint under all service conditions.
8. Gasketed joints on transformer shall be raised above cover.
9. Provide a minimum of two 24" diameter manholes with bolted covers in top of transformer for access to lower ends of bushings, terminals, upper portions of coils, core ground, and to permit replacement of current transformers and other auxiliaries without removing the tank cover. Manholes shall be round. Manholes shall be located so as not to require removal of other accessories to permit access. Manhole covers shall be furnished with handles.
10. The transformer shall be designed and capable of withstanding, mechanically and thermally, a maximum terminal short circuit current from an "Infinite Bus" (Zero impedance source) that can flow in any winding for a period of 0.5 seconds due to a fault.

11. Have adequate bracing of core and coils to withstand handling, shipping, normal and through fault operating forces.
12. Core ground connection shall be accessible without lowering oil level (locate above oil).
13. Combination 2" globe type drain and lower filter valve within 1" of the bottom of the tank with 3/8" or 1/2" sampling device valve. Valve to be furnished with removable plug and cap devices.
14. One (1) inch minimum upper globe type filter valve below the oil elevation of the liquid level gauge. Valve to be furnished with removable plug.
15. All accessory supports shall be adequately supported to provide a stable assembly. Supports for arrestors shall be designed to resist a 40 pound per square foot wind loading on the arresters.
16. The shipping center of gravity shall be plainly indicated and dimensioned on the outline drawing and marked on the transformer tank sides and cover.
17. The completely equipped and oil filled center of gravity shall be plainly indicated and dimensioned on the outline drawing only for use in foundation design.

E. COILS

1. Low voltage and high voltage core shall be circular shape.
2. Low voltage and high voltage windings shall be disk or helically wound.
3. High and low-voltage coil sections shall consist of thermally upgraded insulated copper conductors wound around the core.

Coil sections shall be concentric to counteract forces incurred under short-circuit conditions and shall be provided with oil ducts to dissipate the heat generated in the windings. Coil sections shall be electrically connected together and to the respective terminal bushings of the transformer. Copper conductors in the high and low-voltage coil sections shall conform to ASTM B 48, Type B for applications involving edgewise bending. Coils shall be wound with high-grade, conductivity silverless copper, free from scale and burrs, and shall be insulated with a high-grade paper capable of being oil-impregnated. Coil insulation shall be capable of continuous operation at 65 degrees C rise without harmful effects. Coil winding shall be properly insulated and secured for mechanical protection and strength, and shall be given full protection against permanent deformation under all operating conditions. All leads, buses, and other connections from windings to terminal boards and bushings shall be rigidly supported to prevent damage from vibration. Guide tubes shall be used wherever possible. All permanent circuit-carrying joints and splices shall be brazed, properly formed and finished, and insulated to conform to the basic impulse insulation level. Bolted or clamp-type connections may be used at bushings, tap-changers, and terminal boards provided locking devices are used to prevent loosening of connections. Incoming cables shall be provided with high compression-type lugs with a 2-hole pad to match the bushing terminal.

F. Core and Coil Assembly

1. Core shall be built up with laminated, non aging, low hysteresis loss, high-permeability, grain-oriented, cold-rolled, silicon sheet steel. Laminations shall be coated with an

insulating film or finish to minimize eddy-current losses. Sheet steel shall conform to ASTM A 345. End Yokes shall be secured by bolts, a clamping framework, or by the transformer core. All clamping structures shall have adequate mechanical strength for this purpose. No element in the clamping structure shall permit a permanent deformation. The clamping structure shall be constructed so that eddy currents will be minimized. Core laminations shall be free of all burrs and sharp projections. Each sheet shall have an insulating coating that resists hot oil. All cores and coilers shall be fixed in the tank so that shifting will not occur when the transformer is moved, shipped, or subject to short-circuit stresses. Internal structures shall be securely grounded to prevent electrostatic potentials. Lifting eyes or lugs shall be provided for lifting the core and coils. Provide an external core ground.

2. Joints in windings or at bushings: Brazed or clamped, no soldered.
3. Rigidity: Assembly to be braced or bolted adequately to prevent displacement or distortion under all normal conditions of handling and operation under short circuit conditions.
4. Inside bolted connections: Locking type connections required.
5. Insulation on all conductors used in coil winding process shall be cellulose insulating paper (NOMEX is approved equal.) It shall be wound onto the conductor employing a spinning process. The paper insulation shall be applied in single or multiple strands such that a minimum of 30% of the paper surfaces are overlapped to provide for a continuous insulating surface. Sufficient tension

shall be maintained on the paper strands as to prevent loose wraps. All coils shall include full circumference clamping rings. Core and coils shall be dried using a "vapor phase" system prior to filling with oil. The insulating material, varnishes, and other associated compounds shall not contaminate the insulating oil, nor shall these items be affected by the oil.

6. The ampere rating of all leads shall provide adequate ampacity through the highest 65 degree C rating. The Xo neutral lead shall not be sized smaller than the X1, X2, and X3 leads. All leads shall also provide adequate ampacity capacity for loading conditions described in IEEE C57.92.

B. TRANSFORMER DESIGN CRITERIA

1. Three phase transformer shall have the following ratings and electrical characteristics:
 - A. Transformer type: Two winding, Delta High Side - Wye Low Side, Outdoor Type, Oil immersed ONAN/ONAF.
 - B. Continuous Rating: 10/11.2/14 MVA at 55 degrees C rise with 12% supplemental at 65 degrees rise.
 - C. Frequency cycle: 60 hz.
 - D. Voltage: 34400 - 13090Y/7620.
 - E. High Voltage Taps: 4-2.5% taps; 2 above and 2 below normal voltage with external tap changer for changing taps while transformer is de-energized.
 - F. BIL rating: 200 KV primary; 110 kV secondary; 110 KV neutral.
 - G. Impedance: 6.5% Nominal at Base MVA, In accordance with ANSI C57.12.10 at self cooled rating.

- H. Winding material: copper.
- I. Insulating Fluid: Mineral Oil.
- J. Core/Coil Design: circular disk core/helical wound coil.
- K. Protection: HV Fusing
- L. LV LTC OLTC +/- 10% in .625% steps.
- M. Tank construction: Sealed tank with welded cover and two (2) handholes.
- N. **Integral mounted HV & LV Dead End "A" Frame Structure for aerial cable support.**
- O. Cooling: Panel type radiators, bolted mounting with shutoff valves, fan package.
- P. Paint Finish: ANSI #70 gray.
- Q. Oil Preservation System: A sealed-tank oil-preservation system shall be provided that will seal the interior of the transformer from the atmosphere throughout temperatures ranging to 100 degrees C. Gas and oil volume shall remain constant with internal gas pressure not exceeding 10 pounds per square inch, gage (psig) positive or 8-psig negative. Provision shall be made for the relief of excessive internal pressure in the transformer tank, by the installation of a pressure relief valve. If an inert gas pressure system is offered, sufficient gas for blowing out and displacing the gas space in the transformer shall be supplied, in addition to the full supply required for initial operation. The system shall have the necessary gas supply, adjustable regulator valve, inlet and outlet piping, cylinder pressure/vacuum gauges, and alarm contacts, all enclosed in a weatherproof housing mounted on the transformer case. Bottom of housing shall be no more than two inches above transformer base to handle cylinders replacement. Provide one (1) filled nitrogen bottle (non-returnable). The constant oil pressure system shall be designed to prevent

direct contact between the oil and the air. It may be either an inert gas blanket over the level of oil in an expansion tank, mounted above the oil level in the main tank, or an air cell in the expansion tank having a vent to the atmosphere through a dehydrating breather. The breather shall be located to allow for replacement, refilling, and maintenance without removing the transformer from service. Expansions tanks, used with oil preservation systems, shall have sufficient volume to operate through the ambient temperature range specified without causing the low oil-level alarm contacts to close at the lower limit and without exceeding the recommended full oil level at the upper limit. A shutoff valve, capable of holding the full head of oil in the expansion tank without leaking, shall be provided in the oil line between this tank and the main oil tank. If the expansion tank contains an air cell, the cell material shall have a long life and shall neither affect nor be affected by hot oil. Where an expansion tank or conservator is used in the oil preservation system, cover mounted terminal bushings shall be provided with adaptors to raise the porcelain housings above the maximum oil level in the expansion tank.

R. BUSHING CT'S

1. Primary: one (1) 1200:5 multi ratio CT per bushing.
2. Secondary: one (1) 1200:5 multi ratio CT per bushing.
3. Neutral: one (1) 1200:5 multi ratio
4. All CT'S multi-ratio; relay accuracy C400. All CT'S shall be pre-wired to shorting type terminal blocks in the control compartment.
5. Two (2) CT'S to suit winding temperature and LDC DC control voltage - 48 volts.

S. DC voltage - 48 volts.

C. TRANSFORMER COMPONENTS AND ACCESSORIES

1. In addition to accessories required under ANSI C57.12.00 and ANSI C57.12.10, the transformer shall have the following accessories:

A. Surge Arresters

1. Primary: Three (3), station class, 27KV rated 22KV MCOV.
2. Secondary: Three (3), station class, 10KV rated 8.4 MCOV.
3. Arresters shall be ANSI 70 Gray, porcelain, MOV.
4. Furnish all standard accessories, including base, cap NEMA 4-hole pad standard silicon-bronze flat terminal, mounting bolts, lockwashers, and grounding equipment.

B. Bushings

1. High Voltage: 34.5KV, 200KV BIL, draw lead, Top Mounted.
2. Low Voltage: 15KV, 100KV BIL, solid lead. Top Mounted.
3. Shall be considered (oil filled) type and shall be free of oil leakage and shall have suitable lead-proof sight gauges and with a convenient means for sampling oil and draining the bushings at the mounting flange location.
4. Furnish a 4-hole NEMA standard silicon-bronze flat terminal. Bushing terminal connectors shall be furnished with tinned surfaces.
5. Each bushing shall have a power factor tap for testing purposes.
6. All bushings shall be designed such that impulse voltage flashover occurs outside the tank before flashover occurs on the

bushings inside the transformer.

7. Each bushing shall have the bottom portion suitably covered with an easily removable weatherproof coating to permit outdoor storage.

C. Sudden Pressure Relay

1. Quantity: One (1), one for main tank.
2. Provide 48-volt DC seal-in relays internally wired in the control cabinet on the transformer.
3. The sudden pressure relay and seal-in relay shall be provided with circuitry to effectively prevent false indication of relay operation due to induced voltages in the control wiring.
4. The sudden pressure device shall have means for field testing with a separate pressure source.
5. Wire the seal-in relay terminals to terminal blocks for the City of Newark's external connection.
6. Sudden pressure seal-in relay shall be made by Qualitrol.

- D. Pressure Relief Device: Quantity: one (1) for main tank. Provide with alarm contacts, operation set for 10 psi nominal, provide long arm, yellow semaphore for visual indication.

- E. Magnetic Liquid Level Gauge: With alarm contacts for low level; wire to control cabinet.

- F. Pressure-Vacuum Gauge: With alarm contacts for "high" and "low" pressure.

G. Dial Thermometers

1. Dial type thermometer with multiple field adjustable alarm contacts for high

oil temperature. All contacts shall be individually adjustable to any temperature between 50 to 125 degrees C.

2. Winding temperature indicator: Quantity: one (1) with adequate contacts for cooling control plus one alarm contact for a high temperature alarm. All contacts shall be individually adjustable to any temperature between 50 to 125 degrees C.
3. Dial indicators shall be located for easy readability.
4. Provide resettable drag hand on all dial thermometers.

H. Cooling Equipment Controls

1. Radiators shall be capable of withstanding, without damage or permanent deformation, the vacuum and pressure conditions specified for the tank assembly.
2. Furnish each cooler unit with a lifting eye, and oil drain with valve at the bottom, and a vent at the top. Top and bottom radiator connections to tank shall have valves which can be locked or bolted open or closed.
3. Radiators and fans shall be completely interchangeable among cooler units.
4. Use of heat exchangers in lieu of radiators is not acceptable.
5. Cooling fans shall be located to be readily accessible for inspection and repair. Fan motors shall be 240 VAC, 3 wire, 1 phase. Each fan motor shall be furnished with a disconnecting device to permit removal of the fan without de-energizing the entire cooler group.
6. Tank-mounted radiators shall be removable type with flanged lockable

valve fittings.

- I. High Voltage de-energized tap changer handle with padlock provision.
- J. Grounding: Two (2) welded on ground pads for grounding transformer, with bolted connectors suitable for City of Newark attachments for 4/0 copper cable, one each located six (6) inches up from bottom of tank on two opposite corners. Manufacturer shall connect 4/0 stranded copper cable from one ground pad up to neutral bushing, low voltage lightning arrestors, high voltage lightning arrestors, down to opposite ground pad. Cable shall be securely attached to transformer tank at intervals not to exceed eighteen (18) inches.
- K. **Provide two (2)** 12 point, 48 volt DC alarm annunciators as manufactured by Seekirk.
- L. Lifting facilities for cover, core and complete transformer.
- M. Transformer cover shall be welded to the tank.
- N. Transformer cover shall be slightly domed to shed water.

D. LOAD TAP CHANGER

- 1. Tap changer shall be capable of energized and fully loaded operation through a tap selector switch, contactor mechanism, and impedance device as specified.
- 2. Tap changer equipment shall provide automatic plus and minus 10% adjustment of the low voltage in 32 equal 5/8% steps.
- 3. Rated for full transformer KVA on all tap positions.
- 4. The tap changer mechanism's current carrying contacts shall be capable of 500,000 operations before contacts need to be replaced.
- 5. Switching mechanism shall be enclosed in a separate compartment with a hinged access cover

from the main transformer tank and shall not in any way share the same insulating oil with main core and coils.

6. Provide raise and lower switches for manual operation.
7. Provide auto-manual selector switch.
8. Control Compartment:
 1. Provide terminal board in control compartment for termination of external wiring.
 2. Provide heater with switch and thermostat.
 3. Motor and controls protected by circuit breakers.
 4. Drill plate in bottom of compartment.
9. Provide resistance or vacuum type LTC. Arching tap switch involving direct arcing of the insulating liquid is not acceptable. Approved types include Magnetek type UZD or Reinhausen type RMV.
10. The design of the tap changing equipment shall be such that, in the event the mechanism stops in an intermediate position, the full load can be carried on the transformer without injury to the tap changing equipment.
11. Tap changer shall include the following:
 1. External position indicator with electrically resettable drag hands.
 2. Provide for manual (hand-cranking) operation.
 3. Operation counter.
 4. On-position and off-position contacts.
 5. On-position indicator with maximum and minimum indicating hands equipped with electrical resetting capable of operation by personnel standing at the base of the transformer. The position indicator shall be

readable while operating the LTC manually.

6. Beckwith M-2001D-6L4S20F0S00, Digital Tap Changer Control, no substitutes.
7. Beckwith M-2067B adapter panel, no substitutes.
8. Beckwith M-0329B LTC Backup Control, no substitutes.
9. Lockage weatherproof compartment for motor drive and control equipment, including space heater, light, and convenience outlet.
10. Sudden pressure relay and accessories as specified for main tank, including nameplate, liquid level gauge, pressure relief device, etc.
11. Operation mechanism with motor drive.
12. Motor and controls protected by circuit breakers.
13. Voltage testing terminals.
14. Controls and time delay relays.
15. Line drop compensator with resistance and reactance adjustments.
16. Reactance reversing switch.
17. Current transformer with line drop compensator.
18. Maintenance free dehydrating breather with heater and alarm contact.
19. Beckwith M2025B current loop interface for positive tap knowledge.
20. Incon 1250B programmable position indicator.

E. DE-ENERGIZED TAP CHANGER

Primary winding of the transformer shall be equipped with four 2.5 percent full-capacity taps, two above and

two below normal voltage, brought out to an externally operated manual tap changer. Tap changer handle shall be capable of being padlocked in each tap position and shall be operable when the transformer is de-energized. Taps shall be fully rated. The tap changer and all connections shall withstand the same operating and short-circuit conditions as the transformer winding. No-load tap changers shall be manually operated, for operation only when the transformer is de-energized. A handwheel, with a positive position indicator, shall be provided on the high voltage side for operation of the tap changer. Mechanisms shall be designed to prevent an open winding or short-circuiting when the handwheel is locked in position. Provisions shall be made for padlocking in any tap position. The handwheel shall be operable from ground level.

F. INSULATING OIL

1. Furnish high-quality, high dielectric strength, stable insulating oil suitable for the operating temperature specified.
2. Insulating oil for use in electrical equipment shall be free from additives of any kind, either natural or synthetic.
3. The Manufacturer shall submit to the City of Newark, with his proposal, certification that the insulating oil to be furnished does not contain any mixture of polychlorinated biphenyls (PCB's) as determined by laboratory analysis and test procedures recommended by the EPA.
4. Insulating oil shall meet the following requirements:
 - A. Non-PCB
 - B. Minimum dielectric strength 30-kV per ASTM D-1816.
 - C. Maximum power factor of 0.05% per ASTM D-924.
 - D. Minimum interfacial tension of 40 dyne/cm per ASTM D-971.
 - E. Maximum moisture in oil of 15 ppm after processing per ASTM D-1535.

F. Oil shall be inhibited.

5. Oil not meeting this requirement shall be replaced at the Manufacturer's expense.

G. CONTROL COMPARTMENT

1. Provide a weatherproof, NEMA 4X utility-grade, control cabinet for all auxiliary power, alarm, and current transformer external connections.
 - A. Provide removable plate on bottom of control cabinet to facilitate field drilling for conduit entrance.
 - B. Furnish hinged, gasketed, double access control cabinet doors complete with guides to hold doors open. Cabinet latch and hinge hardware shall be stainless steel. Hinges shall be full length.
 - C. Sub-panels shall be hinged.
 - D. Furnish cabinet ventilation to prevent heat build-up in cabinet. Provide filter and screen to prevent infiltration of contaminants and dust into control cabinet.
 - E. Provide a duplex receptacle, protected by a ground fault interrupting (GFI) circuit breaker, in the cabinet.
 - F. Furnish a light switch.
 - G. Provide a drawing pocket on inside of door.
2. Minimum wire sizes
 - A. CT Circuits - #10 SIS
 - B. Internal control wiring - #14 SIS
 - C. Internal power wiring - #12 THHN
 - D. A permanent identification label shall be attached to each wire at its point of connection.
3. Provide branch breaker disconnects for each AC

subfeed. Include sub-fusing for branch power circuits (GFCI receptacle, space heaters, working lights, auxiliary fans, other items).

- A. Motor and accessory voltage - 240 VAC, 3 wire, single phase
 - B. Thermostatically controlled space heaters/lighting and outlet - 120VAC, 2 wire, single phase.
- 4. Minimum enclosure size is 40" (W) by 40" (H) by 24" (D).
 - 5. Submit typical schematic with bid for evaluation.
 - 6. Low voltage motors and fans shall operate at 240 VAC, single phase, three wire.
 - 7. Control Compartment to contain:
 - A. Only gray Panduit is acceptable.
 - B. All breakers and devices shall be labeled with a phenolic nameplate that contains the device number and a short description.
 - C. All indicating lights shall be LED.
 - D. Provide separate switches for LTC raise/lower and auto/manual.

H. FUSING

The transformer shall be provided with 3 primary fuseholders on the primary side of the transformer to accommodate properly sized S & C 35kV SM5 fuses.

I. DEAD END STRUCTURE

The transformer shall be provided with an integrally mounted dead end "A" frame structure for support of aerial HV and LV wires.

J. ALARMS

Contacts shall be provided for the following alarms and wired to **two (2) Seekirk annunciator** panels so each alarm can be seen and monitored remotely:

1. Top oil temperature. (26Q)
2. Oil levels main tank and top changer. (71Q-1) (71Q-2).
3. Under and over pressure on main tank. (63G-P) (63G-V).
4. Sudden pressure. (Main Tank 63SR-1)
5. Sudden pressure LTC. (63SR-2)
6. Mechanical pressure relief device main tank. (63PR-1)
7. Mechanical pressure relief device tap changer if required. (63PR-2)
8. Loss of AC 20 second time delay for fans (27-1) and cooling control. (27-3)
9. Under voltage alarm on LTC (27-2).
10. Hot spot temperature. (49)
11. Nitrogen system HI/Low/Empty tank.
12. LTC failure 86X.
13. Dehydrating breather failure alarm.
14. 90 self test alarm.
15. Minimum of three (3) spare contacts for future use.
16. All leads to be brought in to test switches and terminal blocks located in the control cabinet and wired to the annunciator panel.

PART 3 - EXECUTION

3.01 WARRANTY

The manufacturer shall supply a five (5) year warranty period for the entire transformer. A price shall also be given for extending the warranty period to five (5) years if the standard warranty for the transformer is less than five (5) years.

3.02 LOSSES

- A. Loss evaluation rates are as follows: no load losses @ \$7031/KW; load (copper winding) losses @ \$1064/KW (@7.5MVA base rating); auxiliary losses @ \$941/KW @ 7.5MVA base rating.
- B. In the event the transformer furnished under this proposal fails to meet the loss guarantees submitted by the Bidder, an adjustment in the price will be made at the evaluation rates listed above.

3.03 FIRM PRICE BID

The City of Newark will accept only a firm price with no escalations. Payment will be under the following schedule:

10% upon award of bid
30% upon completion of design and material order
30% upon completion of assembly
20% upon completion of final testing
10% upon delivery and acceptance (not to exceed 10 days from receipt)

- 3.04 F.O.B. Substation Site, East Main Street Substation, Newark, Delaware, ready for offloading by City of Newark's Contractor in full functional state ready for energized use. If transformer must be shipped partially assembled, (i.e., without oil, radiators, and/or bushings), Manufacturer shall provide at no additional cost, qualified personnel, equipment, and tools as necessary to complete assembly. (City of Newark will furnish lift truck and general labor to assist with lifting and placement of bushings, radiators, etc.; however, Manufacturer shall supervise and be responsible for completing assembly.)

3.05 SPARE PARTS

- 1. Provide the following spare parts:
 - A. Standard accessories
 - B. Exterior touch up paint
 - C. Special wrenches/tools standard with manufacturer.
 - D. Spare set of gaskets for bushings, terminal chambers, handholes and the gasket on the pressure relief valve.

- 3.06 The dimensions of the transformer are critical to ensure it fits in the existing substation. Tank dimensions shall not exceed (with all doors closed) 163"W (Control Cabinet side) by 144" Deep.

CITY OF NEWARK
Delaware

CONTRACT NO. 15-01

PURCHASE OF A 10/11.2/14 MVA POWER TRANSFORMER

PROPOSAL

TO: The Mayor and City Council
 Newark, Delaware

FROM: _____

The undersigned as a lawfully authorized agent for the below named Bidder has carefully examined the General Provision, Specifications, and Proposal to be known as Contract No. 15-01 and binds himself upon award to him by the Mayor and City Council of Newark, Delaware to execute in accordance with such award, a contract of which contract this Proposal and said General Provisions and any Addenda shall be a part, and to furnish the equipment as specified F.O.B. Newark, Delaware in a manner that is in complete accordance with said General Provisions and Specifications, at the following named prices for the items:

BIDDER _____

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>DEL'Y</u> <u>MFG'R</u>	<u>BID</u> <u>ARO</u>	<u>FIRM</u> <u>PRICE</u> <u>INCLUDING</u> <u>ANY</u> <u>SHIPPING</u> <u>CHARGES</u>
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1	10/11.2/14 MVA Transformer	_____	_____	_____
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Manufacturer/Factory location _____

Main core circular helically wound YES or NO _____

34.4kV feeder aerial YES or NO _____

Maximum length and width of unit _____

Transformer tank base dimension _____

Unit delivered in one piece or separately _____

Standard 5 year warranty YES or NO _____

Price adder for 5 year warranty _____

All component failures covered under warranty YES or NO _____

Impedance % on own base _____

Tank height _____

Height over high voltage bushing _____

Height over low voltage bushing _____

Shipping weight _____

Insulating system _____

Gallons of oil required for main tank _____ LTC _____

Oil shipped in transformer YES or NO _____

LTC manufacturer and model number _____

Can LTC be manually operated safely without de-energizing transformer

YES or NO _____

Load Losses @ base rating _____

No Load Losses @ 100% rated voltage _____

Bidder agrees to abide by payment schedule in Section 3.03 Yes ___ No ___

One high voltage bushing gasket. Included: Yes ___ No ___

One low voltage bushing gasket. Included: Yes ___ No ___

Four radiator bushing gaskets. Included: Yes ___ No ___

One manhole gasket for each manhole. Included: Yes ___ No ___

A frame included in bid Included: Yes ___ No ___

Fuse holder and brackets included in bid Included: Yes ___ No ___

Touch up paint included Included: Yes ___ No ___

Any special wrenches/tools included Included: Yes ___ No ___

Weight of transformer complete with oil _____

Sketch or drawing of transformer completely assembled giving outline dimensions and suitable for use in picturing what this specific transformer shall look like in both plan and elevation included. Yes ___ No ___

List of all material that will be removed from the transformer for shipment.

NEMA form entitled "Performance Specifications for Transformers" shall be supplied with proposal. Yes ___ No ___

Exceptions:

NOTE: Bidders are hereby reminded that, as part of this Proposal, they are required to submit descriptive literature on the equipment to be supplied and a copy of the warranty policy.

DATE: _____ BIDDER/CONTRACTOR: _____

BY: _____
IT'S LEGALLY AUTHORIZED REPRESENTATIVE

TITLE: _____

STREET ADDRESS: _____

CITY, STATE, ZIP: _____

TELEPHONE: _____

CITY OF NEWARK
Delaware

CONTRACT NO. 15-01

PURCHASE OF A 10/11.2/14 MVA POWER TRANSFORMER

BOND TO ACCOMPANY PROPOSAL

(not necessary if certified or cashier's check is used)

KNOW ALL MEN BY THESE PRESENTS THAT _____ of
_____ of the County of _____ and
State of _____, principal, and
_____ of _____ as
surety, legally authorized to do business in the State of
Delaware, are held and firmly bound unto the City of Newark in the
sum of _____ Dollars, to be paid to
said City of Newark for use and benefit of the Mayor and Council
of Newark, for which payment well and truly to be made, we do bind
ourselves, our and each of our heirs, executors, administrators
and successors, jointly and severally, for and in the whole,
firmly by these presents. Sealed with our seal dated the
_____ day of _____ in the year of our Lord, two
thousand and fifteen (2015).

NOW THE CONDITIONS OF THIS OBLIGATIONS IS SUCH, that if the
above bounded principal who has submitted to said City of Newark,
a certain proposal to enter into a certain Contract No. 15-01,
Purchase of a 10/11.2/14 MVA Power Transformer, and if said
_____ shall well and truly enter into and executes
said contract and furnish therewith such Surety Bond or Bonds as

may be required by the terms of said contract and approved by said City of Newark, said Contract, and said Bond to be entered into within ten (10) days after the date of official notice of award thereof in accordance with the terms of said proposal, then this obligation to be void, otherwise shall remain in full force and virtue.

SIGNED AND SEALED IN THE
PRESENCE OF WITNESS:

SIGNED _____ (SEAL)

BY _____ (SEAL)

SIGNED _____ (SEAL)

BY _____ (SEAL)